

Use of Remote Sensing in Shoreline and Near-Shore Management

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My perspective on shoreline and near-shore management is that of a governmental program manager rather than that of a scientist or technician in the field. The disciplines that contribute specialized information to successful decision-making in the shoreline and near-shore zones are best left to these specialists. The function of the Maryland Department of Chesapeake Bay Affairs and other agencies like it is to receive such specialized information, apply it within a legislated system, and make decisions contributing to the legislative objective. Examination of a Bay resource problem from this perspective should suggest problems and opportunities for the application of remote sensing technology that will be somewhat different from most of those already discussed.

Two laws applying to the management of shoreline and near-shore activities form a frame of reference; the first is hypothetical; this can be called the Maryland Tidal Shoreline and Near-Shore Management Act of 197X. It is a law that is rather vague in concept, but increasingly clear in need. Modest development work on such an act is underway in Maryland, and similar ideas are in various stages of development in some other coastal zone states. The second law is the Maryland Wetlands Act of 1970, which has been in legal effect for just nine months.

First, though, here are a few loose definitions. Shoreline activities are defined as those events taking place on land within about 200 feet of shoreline that have an effect on, or are affected by, open water. This excludes some events that might take place near water but are not generally related to it—such as land traffic movement. It includes physical events like earthmoving and psychic events like sitting on a porch and watching whistling swans feed in a cove. Near-shore area is defined as the shallow water area within which man is likely to build something like a pier, jetty, or bulkhead; typically, he may want to modify the bottom to float a deeper-draft boat; create new land or acquire fill material; and engage in activities that affect, or are affected by, other shore or near-shore activities, such as waterskiing, skin diving, hunting ducks, or launching beer cans.

The Shoreline and Near-Shore Management Bill of 197X is written with the recognition that much activity is going on in this zone that affects other uses in the zone and in areas beyond, either landward or waterward. Further, these activities are increasingly competing, resulting in actual and potential conflicts between uses and between stated and unstated *public policies* regarding the zone. In short, the zone is one of multiple use tending toward a less than optimum mix of uses.

The law explicitly recognizes the public and private benefits of the use of the zone for sport and commercial fishing, boating, skiing, and swimming; for the location of residences, summer homes, parks, water-oriented industries, and waste treatment plants; for laying of public utility lines, construction of bridges, and extraction of minerals including fill material. In short; the law acknowledges that some sector of society is benefiting from each use to which the zone is put. Further, the law enumerates the importance of the zone to the area beyond, to the economy of the state, to the Bay and ocean biological productivity, and to the general character or style of the Bay region. Further still, the law enumerates the public costs of shore erosion, noise and nuisance, loss of life and property from floods and accidents, and of ugliness, disease, and disorder. Finally, the law states that there is a natural system to be protected and a tradition and way of life to be preserved.

The purpose of the law is to establish a system whereby the State will regulate man's activities in the near-shore and shoreline area to increase the benefits of the zone and reduce or eliminate the costs and conflicts. This objective is easy to state in the abstract. It is much more difficult to establish a mechanism to achieve it, and still more difficult to execute.

The mechanism is as follows: First, the responsible state agency establishes zone boundaries according to various physical, geographical, and biological categories. Typical questions to be answered in this first step are: Where are the lowlands, where are the steep banks, where is land close to deep water, where is land far from deep water? Where are the coves, beaches, marshes, and mud flats? Answers to these questions sound rudimentary and readily available, but the information involved needs to be put in far more organized and accessible form than it is now.

Second, the agency determines what is going on in the zone. Where is industry, where is dense residential development, where is rapidly expanding recreational home site construction? Where are the concentrations of swimmers, fishermen, and birdwatchers? Again, this seems like common information, but its sources are scattered, disorganized, and highly variable in reliability.

Third, the agency, after public hearings and inter-governmental consultation, draws up guidelines and criteria for spatial location of various near-shore water uses. Certain areas are identified as being better than (or not so good as) others for various kinds of uses and use mixes. For example, limits are postulated for the number of boats and piers a cove can accommodate, the amount of shoreline that can be bulkheaded, and area of the bottom disturbed without sharply affecting biological productivity and other values. Certain areas are identified as being especially suitable for high density boating use, or for retention of natural character, or for use by heavy industry.

Fourth, the State exercises its sovereign regulatory powers to control the uses of the water surface, water column, and bottom to move toward the desired state of optimal use, using as its guidelines in case-by-case situations the criteria developed in step 3.

Fifth, surveillance and enforcement of regulations represent the control and compliance phase of regulation.

And finally, the effects of this regulation are monitored to provide information for making possible changes to the basic guidelines and criteria or to the decision-making process.

This is admittedly a simplistic scheme. There are many difficult steps involved, perhaps the most difficult being that of standard and criteria-setting; that is, the development of a plan. Enormous amounts of data have to be assembled and displayed to make such a program work. Most states, including Maryland, have had experience with regulation of the activities to which I have been making reference. But most of these have been conducted without clear concepts of the existing conditions of the zone, the changed character when given various developmental vectors, regulation achievements to date, and the desired change in conditions over time. In short, the programs have been regulatory programs without baseline information, without goals, and without feedback.

Some aspects of the Maryland Wetlands program relate to information needs and information portrayal. This program, which regulates dredging and filling in State wetlands, and a wider range of activities in private tidal marshes, has the policy objective of protecting and preserving the wetlands of the State. It is but a special case of the more general shore-area regulatory function just described. Only one primary social objective is involved—the protection of the biological contributions of wetlands—and only a few of the many possible activities are regulated. Yet, the problems of execution are essentially the same as those under a more general law.

First, we need to know what is there. The laws call for an inventory and mapping of all private tidal wetlands in accordance with a rather rigorous physical and legal definition. We have needed to look at the Bay area in a new way; that is, to ask for new information. False-color infrared photography taken from 6000 feet has been used when marsh vegetation was at maximum vigor. Then, marsh plant species and associations were identified and from their distribution various zones of tidal influence were inferred. The zones that are subject to regulation are then mapped. Early mapping experience has surfaced some technical difficulties, but this is one of the few feasible approaches, given constraints of time, money, and legal requirements.

In addition to this mapping requirement, which involves at least some sophistication by way of the application of remote sensing, some mundane information needs also exist. For example, our cases must be located. An application typically includes a 1:24 000 scale vicinity map of the area with a small mark indicating the location of proposed work. Somewhere in the Department of Natural Resources, probably a field worker or law enforcement officer knows that site well but this person's description of the site cannot generally be gotten. With a small staff and an application rate that runs to several hundred cases a year, a quick way to get information about land use, vegetation, water depth, topography, and the general character of the area is needed. Furthermore, the accuracy of the plan as it depicts the existing shoreline and the locations of dredged and filled areas should be checked. Presently, short of conducting our own ground survey, we have to rely on the accuracy and completeness of the plans of the applicant.

Further, a rapid, extensive, and inexpensive method of enforcement, surveillance, and inspection is needed. We need, for example, to be able to check on an applicant's conformance with the physical limits set by a license, and to be able to detect illegal dredging and filling operations.

Finally, we need readily available information of a wide variety to serve as the basis of decision-making and as the source of continual upgrading of the rationale behind our decisions.

I would like to close by highlighting one point that Governor Tawes mentioned in his address. Successful management of the shorelines and near-shore areas depends ultimately on public acceptance of the importance of such management and acceptance of the methods by which it is undertaken. If this management is to be rational, it must be based on a realistic popular conception of what the situation is, how it got to be this way, and where it is going.

Imagery from the air seems to me to convey an unusually strong message as to current patterns and trends in Bay shoreline use. To view the Bay from 60 000 feet using high resolution color photography is a most revealing experience even to persons who know the Bay shoreline well. For the general public, for legislators, and for managers without extensive field experience, it is a highly valuable educational experience. I am sure that there are types of imagery and techniques of presentation that would have significant impact on the attitudes of persons other than planners, managers, and scientists. Because there are so many interests involved in shoreline use, and because the problems there are only soluble with broad public acceptance of government programs, the public information aspects of remote sensing are of prominent importance. I suggest that we give attention to this general public use of remote sensing information, as well as to the more specialized potential uses by the scientists and technicians assembled here.